ISSN 2349-0837
Volume 6 Number1
Journal of Advances in Agriculture

Understanding and Building on Indigenous Agro-Pastoral Adaptation strategies for Climate Change in Sub-Saharan Africa: Experiences from Rural Cameroon

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ABSTRACT

Rural communities in the Sub-Sahara African region have become focal points for climate adaptation especially in the agricultural sector. This is due to their significant involvement in agro-pastoral activities which constitute the lifeblood of most of the economies of this region, with about 85% of the indigenous populations relying on it for their survival. Both long and short term climatic oscillations have succeeded, and will continue to disrupt crop and livestock output thus signaling threats to food security. Although the communities have either consciously or unconsciously made use of some indigenous adaptation strategies, they are judged to be weak at the moment. This requires the designation of context-specific agro-pastoral adaptation frameworks. Using focus group discussions (FGDs) of 6 agro-pastoral groups (10 representatives each) in this region, complemented by content analysis, field surveys and the extensive review of literature on case studies for other SSA communities, we analyze current indigenous adaptation mechanisms in the agro-pastoral sector and attempt to construct an indigenous adaptation framework for rural agro-pastoral communities in Cameroon. Our analysis of data leads us to conclude that current adaptation measures rely mainly on crop diversification and mixed farming. Although these methods are good, the scale of operation and the degree of diversification is still low to climate-proof the agro-pastoral sector. Furthermore, these changes are introduced in the midst of poor farming practices such as slash and burn and related systems. Current indigenous adaptation strategies are weak and are correlated with income levels, level of farmers involvement in organizations, knowledge and perception. We recommend the effective engagement of agro-pastoral stakeholders as key in developing an adaptable framework, based on their knowledge of current adaptation strategies.

Indexing terms/Keywords

climate change; indigenous adaptation; agro-pastoralism; SSA; Cameroon

Academic Discipline And Sub-Disciplines

Agriculture; Rural Economics; Environmental studies

SUBJECT CLASSIFICATION

JEL: Q01; Q18; Q54

TYPE (METHOD/APPROACH)

Participatory Rural Appraisal: Focus Group Discussions, contentment analysis; Quantitative analysis: surveys; Literary Analysis; Literature Review

INTRODUCTION

Climate variation is a global reality today. Rural communities around the globe in general and in the Sub-Sahara African (SSA) region are expected to be highest hit by climate variability (Molua 2009, IPCC 2014). This is based on the fact that most livelihoods in such areas depend to a large extent on agriculture. In sub Saharan Africa, the agro-pastoral sector remains the lifeblood of most economies of this region with about 85% of the indigenous populations in rural areas relying on such activities for their survival (Mahendra et al. 2008). The caprices of climate have therefore been the bane of economic development in SSA economies which are largely agro-pastoral dependent. The less resilient and vulnerable agriculture dependent societies continue to bear the brunt of climate change. Increasing dryness stand as one of the most devastating effects of climate variability and change and this has succeeded to disrupt food crop output thus signaling threats to food security (Odingo, 2008). It is not surprising therefore that such areas have become focal points for climate adaptation studies. Although the communities have either consciously or unconsciously developed and maintained some indigenous adaptation strategies, they are often judged to be weak at the moment and require much improvement (Holzmann *et al.,* 2003). There is therefore a continuous need to analyze and include indigenous knowledge into adaptation strategies to reduce climate effects, especially on agro-pastoral communities in SSA. This article intends to contribute to this sphere of knowledge.

1.1. Background and problem statement

SSA's exposure to climatic shocks is due to a cocktail of 'multiple stresses' including land degradation and desertification, declining run-off from water catchments, high dependence on subsistence agriculture, institutional inadequacies, rapid population growth occurring at various levels, low adaptive capacity due to factors such as extreme poverty, frequent natural disasters mainly in the form of droughts and floods, dominance of rainfall-dependent agriculture and an upsurge of terrorism (IPCC 2007; Boko et al., 2007, IPCC 2014, Balgah et al, 2015, UNISDR 2015a). In spite of the eminently devastating effects of climate change in SSA, all hopes cannot be lost, as there are potentials and indigenous efforts to adapt. Such indigenous adaptation techniques often applied over generations by specific communities need to be identified, strengthened and promoted to limit the effects of climate change on the generally agriculture based populations in SSA (IPCC 2014, UNISDR, 2015b, UNFCC, 2016).

Important adaptation options currently applied in the agricultural sector include crop diversification, livestock farming, mixed cropping systems, using different crop varieties, changing planting and harvesting dates, mixing less productive, and using drought resistant varieties alongside high yield water sensitive crops (Oyekale *et al*., 2009).

From a general perspective, agricultural adaptation involves at least two types of modifications in production systems. The first is increased diversification that involves engaging in production activities that are drought tolerant and or resistant to temperature stresses as well as activities that make efficient use and take full advantage of prevailing water and temperature conditions and other existing factors. Crop diversification can serve as insurance against rainfall variability as different crops are affected differently by climate events (Oyekale *et al*., 2009). The second strategy focuses on crop management practices geared towards ensuring that critical crop growth stages do not coincide with very harsh climatic conditions such as mid-season droughts. Crop management practices that can be used include modifying the length of growing period and changing planting and harvesting dates (Jagtap, 1995, Ludi *et al.,* 2007, Oyekale *et al*., 2009).

Great strides could be made in climate-proofing the agricultural sector in SSA by introducing indigenous adaptation strategies and/or strengthening existing ones. Since climate change appreciation and adaptation are governed by a number of factors, including perception, cultures and socio-economic status, context-specific indigenous adaptation strategies could better address agricultural problems (Lambi, 2001, FAO, 2009, Ngwa and Balgah, 2016). In Cameroon for instance, adaptation mechanisms are currently being employed by agro-pastoralists in rural communities in the North West Region. The adaptation strategies are often very different for crop and livestock farmers. Crop farmers for instance apply extensive farming and diversification while livestock farmers engage in transhumance. This has often led to farmer – grazier conflicts (Lambi and Ngwa, 2008, Kimengsi, 2015). While it is plausible that both crop and livestock production is crucial for the inhabitants of this region in particular and for national food security in Cameroon in general, very little efforts have been made to build a framework for indigenous adaptation which will harmoniously sustain the cropping and livestock sectors in the face of increasing vulnerability.

The objective of this study is therefore to propose an indigenous adaptation framework for rural agro-pastoral communities in the northwest region of Cameroon, based on indigenous adaptation strategies.

Specifically, the focus of this study is to (1) Examine current indigenous adaptation mechanisms in the agro-pastoral sector, and (2) Attempt to construct a climate adaptation framework which could be easily adopted by similar agro-pastoral communities in other parts of Cameroon and in SSA in general.

2. Literature Review

2.1. Indigenous knowledge and adaptation to climate change in SSA

The role of indigenous knowledge to enhance the adaptation of rural communities to climate change cannot be overemphasized. According to Swart *et al.* (2003), indigenous knowledge has been earmarked as a good option in climate change adaptation. Therefore, incorporating indigenous knowledge into climate change policies can lead to the development of effective mitigation and adaptation strategies that are cost-effective, participatory, and sustainable (Hunn, 1993, Robinson and Herbert, 2001). This is best achieved when indigenous knowledge complements, rather than competes with scientific knowledge systems (Nyong *et al.*, 2007). It has been revealed that local communities in the Sahel had successfully achieved some level of sustainable livelihoods by adapting continuously in their farming, livestock keeping, and other income-earning activities (Mortimore, 2000). Building on the indigenous knowledge systems of the region offers great prospects for effective integration of mitigation and adaptation strategies that will be attractive enough to the vast majority of small-scale farmers who are expected to employ them (Nyong *et al*, 2007).

Most agricultural systems in SSA depend on rain-fed agriculture. Mongi *et al* (2010) conclude that with increasing climate variability and the vulnerability of rain-fed agriculture, there is a need to develop appropriate strategies for reducing vulnerability of rain fed agriculture. This could be achieved by helping local farmers to use their local knowledge and combine it with introduced innovations to enhance local adaptations to climate change and variability. Best Practices in indigenous adaptation should focus on the integration of indigenous knowledge with modern techniques—a mix that proves more valuable than either one on its own. The interaction between the two different systems of knowledge can also create a mechanism of dialogue between local populations and climate change professionals, which can be meaningful for the design of projects that reflect people's real aspirations and actively involve communities (Nyong *et al.,* 2007). Enabling small farmers to adapt to impacts of climate change requires making access to knowledge and information essential. This is especially important considering projections that poor countries, which generally have the least level of technological innovation, will be hit hardest by climate change (Ludi *et al.,* 2007). New ways of sharing innovation and information

between private and public sectors to deliver technologies that enable adaptation (and mitigation) must be developed in the next few decades.

2.2. Crop-Livestock systems: importance and complementarity for climate change adaptation

The complementarity of crop and livestock systems for the sustainability of agriculture especially in developing countries has long been recognized (Wolmer, 1997, Scoones and Wolmer, 2000). However, renewed interest has been demonstrated since scholars began to realize that indigenous communities practicing either crop production systems or animal production systems increasingly adopted integrated approaches as a means to secure livelihoods, adapt production systems to contempary lifestyles and cope with uncertainties and challenges emerging from demographic growth, globalization and climate change (Wolmer 1997, IPCC, 2014). Increasingly, livestock provided food to farming households as well as manure and draught power for crop farming. Importantly, crop -livestock systems provided income and insurance and buffered shocks in case of climate related failures (Wane *et al.*, 2009, Seo, 2010, Balgah and Buchenrieder, 2011, Moraine *et al.,* 2014). Seo (2010) for instance in a survey of over 9000 farms in Africa found out that farms adopting crop and livestock systems were more resilient and more profitable under uncertain weather conditions than specialized ones. Moraine *et al* (2014) report similar findings in their analysis of over 15 case studies across Europe. In addition to benefits from ecosystem services, they found out that crop livestock systems stimulated cooperation amongst and between farmers and other stakeholders, and generated opportunities for social innovation. Clearly, systems integrating crop and livestock can help agricultural adaptation to climate change. We apply this concept to understand and build and propose strategies that can support Cameroonian farmers who live mainly in rural areas, to adequately adapt to climate change.

3. Materials and Methods

3.1. The Study Area

The North West Region of Cameroon lies between latitudes 5°43" and 7°9"N and longitudes 9°13"and 11°13"E, covering a total surface area of about 17,400km2 (BUCREP, 2010). It is bordered to the North and West by the Republic of Nigeria, to the South by the West and South West Regions, and to the East by the Adamawa Region. The region has a varied relief of lowlands, hills and mountains ranging from 400m to 3000m above sea level and consists of deep valleys, plateaux and steep escarpments (Lambi *et al.,* 2008). The hilly environment is intersected at some points by plains with the prominent ones being the Ndop and the Mbaw plains. Broad valleys which are rich in alluvium also occur in the region. The average precipitation is 2400mm with peak rainfall occurring between mid-July and mid-September. Temperature fluctuations are great but the general average is 23oC (Lambi *et al,* 2008, BUCREP, 2010). Despite the high amounts of rainfall, the area is still void of luxuriant vegetation and this could be blamed on increasing human activities such as arable farming, cattle grazing and settlement expansion, among others. The inhabitants of the highlands are mainly farmers who have cultivated the land very intensively. However, livestock rearing is practiced by a relatively small fraction of the population in the highly rugged and lofty uplands of the region.

Figure 1: Map of Cameroon showing its North West Region

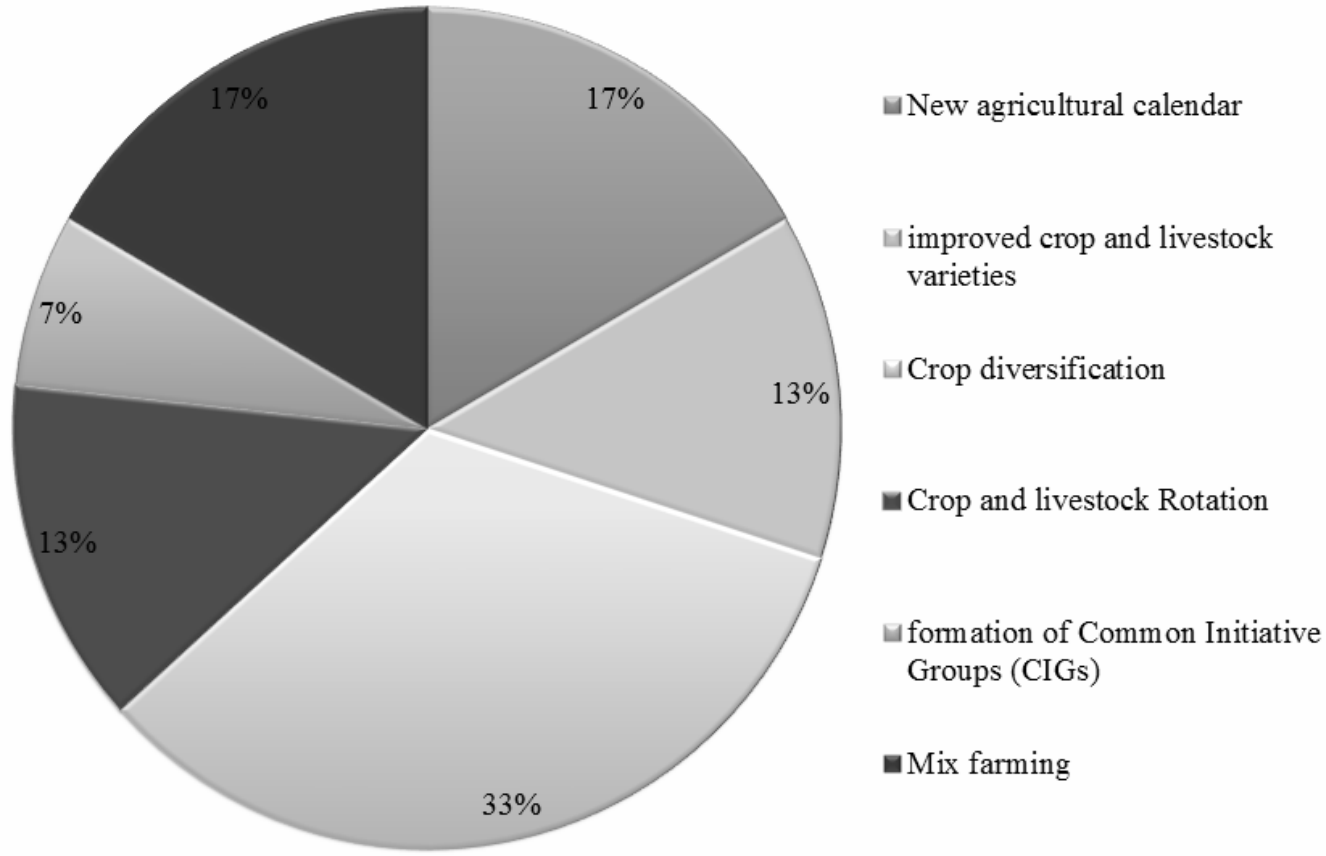
3.2. Methodology

Extensive literature review was done for on indigenous adaptation strategies especially within humid agro-ecological zones of sub Saharan Africa. This was undertaken to ascertain the efforts that have been made in different contexts to climate-proof the agro-pastoral sector. The reviews identified a series of indigenous adaptation strategies, which generally have been judged in the topical literature to be weak in adapting to climate change (Holzmann et al., 2003, Balgah and Buchenrieder, 2010). This prompted the use of focus group discussions (FGDs) of 6 agro-pastoral groups (10 representatives each) in this region, complemented by field surveys to analyze the adaptation strategies of agro-pastoral groups in six targeted communities – Kumbo, Ndop, Benakuma, Befang, Dumbo and Misaje. The groups consisted of arable farmers and graziers or those who practice both activities. Participants who were chosen had spent at least 5 years in the practice with their age groups ranging from 30 to 55. At least 3 women constituted part of the discussion groups, as women remain very important for achieving food security at household level in the region. The key issues raised during the FGDs centred on participants perceptions of climate change effects on the agro-pastoral sector and their current adaptation efforts.

The researchers made use of the content analysis involving the transcription and examination of participant's diverse opinions. This gave room for proper analysis of the diverse views of participants without eliminating or suppressing their views expressed in the focus groups discussions. Such an analytical strategy was chosen because it could clearly portray the intricacies associated with employing local adaptation strategies. In addition, descriptive statistics involving the use of charts and percentages were employed. This gave a better insight on the situation and guides the development of the indigenous adaptation framework.

4. Results

Current adaptation measures rely on crop diversification (33%), mixed farming (17%) and the introduction of a new agricultural calendar (17%). Although these methods are good, the scale of operation and the degree of diversification is still low to climate-proof the agro-pastoral sector. Furthermore, these changes are introduced in the midst of poor farming practices such as slash and burn and ankara systems (Figure 3). The study showed that the current indigenous adaptation strategies are weak and have a connection with income levels, level of farmers organizations, knowledge and perception.



Figire 2: current Indigenous adaptation meaures

Figure 3: Slash and burn and ankara methods are challenges to indigenous adaptation practices

Indigenous adaptation practices are constrained by income levels (40%), level of farmers' organization into groups and cooperatives, farmers' knowledge (20%) of the adaptation strategies and their perception (10%) towards those practices. This is illustrated in Figure 4 below.

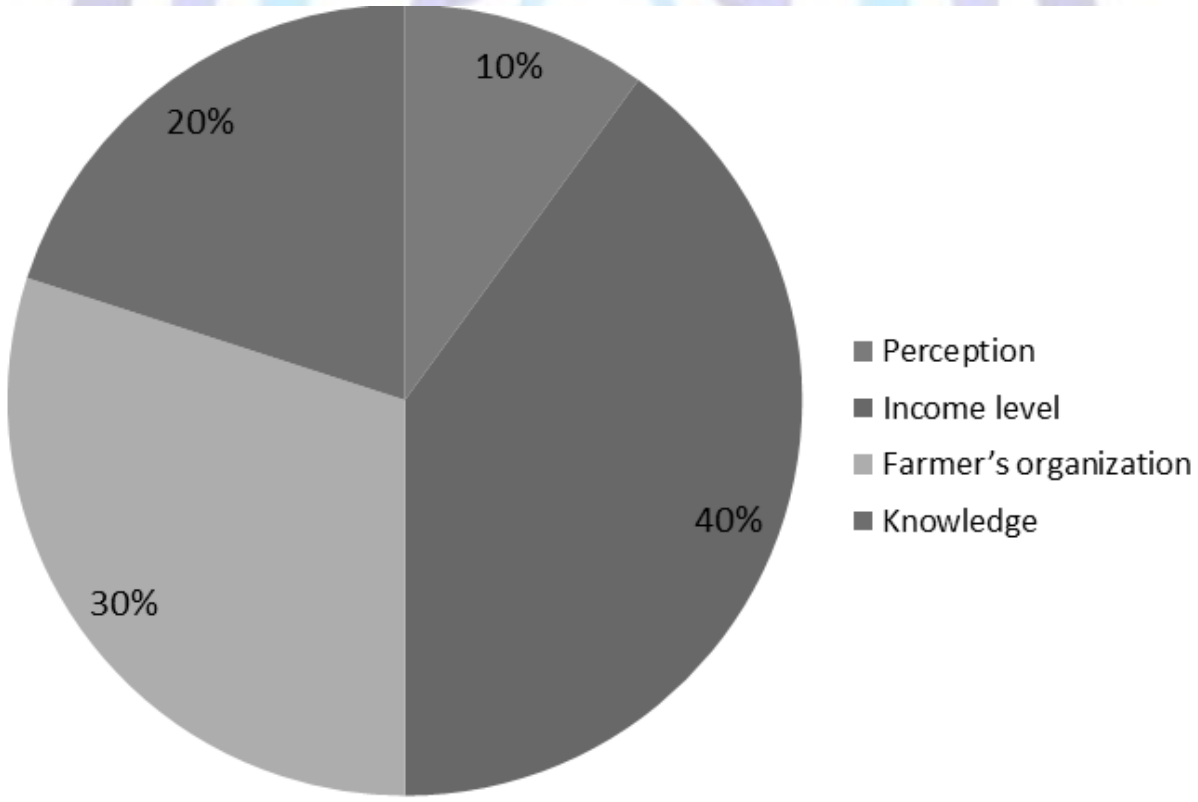


Figure 4: Determinants of adaptation

The current situation of indigenous adaptation strategies requires a series of recommended actions to improve on them. These actions will form the basis for the development of an indigenous adaptation framework to climate change in the North West agro-pastoral sector (Table 1).

Table 1: Situation of current indigenous adaptation strategies and recommended action in the research region

Strategy	Current situation	Remarks	Recommended action
Crop diversification	Farmers introduce diverse crop varieties to maximise yields in the face of climate variability	Less than 50% of farmers employed this strategy. Cropping density and competition for nutrients affects yields	A more careful diversification of less competing crops
Mix farming	Cattle and arable farming is undertaken to reduce shocks emanating from any of the sectors	A good approach but less than 20% of agro-pastoralists employ this strategy. Mix farming is also constrained by poor production techniques and land scarcity	More emphasis on this method with modern production techniques would improve output.
New agricultural calendar	A readjustment of cropping and cattle grazing periods (transhumance) due to alterations in the onset and cessation of rainfall.	Good but poorly defined approach. Very few farmers use it and it is constrained by lack of information, perception etc.	More careful definition of the new agricultural calendar would increase output
Crop and livestock rotation	Rotation of cropping and pasture land ensures increase in crop output and pasture availability	Good but timidly employed because of access to land challenge. Slash and burn system of farming affect this.	Increasing adoption of crop and livestock rotation.
Improved crop & livestock varieties	This ensures greater crop and livestock output.	Less than 15% of farmers employ this strategy. They are constrained by limited resources.	Increase access to improved crop and livestock varieties.
Formation of common initiative groups (CIGs)	CIGs are meant to strengthen farmers are they undertake group action to address their common problems.	Less than 10% of farmers belong to groups. Groups seldom share problems related to climate change.	Encourage farmers to belong to CIGs. Strengthen CIGs capacities to handle climate related problems.

5. Discussion, Conclusions and Recommendations

This article set out to understand and build on Indigenous adaptation strategies for climate change in Sub-saharan Africa, based on an empirical case study from Cameroon. Using focus group discussions complemented by content analysis, field surveys and literature review, we tried to explore indigenous adaptation strategies and to analyze to what extent they could form the basis for an inclusive, adaptive framework for adapting to climate change effects in Cameroon in particular and in Sub-saharan Africa in general.

Crop-livestock systems were generally found to be important for farmers to adapt to climate change effects in the research region, in addition to using adapted varieties of crops and dissipating risks through community based risk sharing institutions.

Based on the results, we conclude that current adaptation measures rely mainly on crop diversification and mixed farming. However, although these methods are good, the scale of operation and the degree of diversification is still low to climate-proof the agro-pastoral sector. Furthermore, these changes are introduced in the midst of poor farming practices such as slash and burn and ankara systems. In addition, current indigenous adaptation strategies are weak and have a connection with income levels, level of farmers organizations, knowledge and perception.

From the above analysis, the following actions are recommended in the development of an indigenous adaptation framework for agro-pastoral development in the North West Region of Cameroon.

Firstly, from a holistic perspective, consideration must be given to identify key gaps in the current adaptation strategies, undertake crop suitability mapping, engage agro-pastoral stakeholders in the framework design to make it context specific and attempt to construct a climate adaptation framework which could be easily adopted by agro-pastoral communities in SSA in general and Cameroon in particular in order to effectively climate-proof this life sustaining sector.

Specifically, a more careful diversification of less competing crops and more emphasis on mixed farming with modern production techniques is necessary by agro-pastoralists in the study area. A much clearer definition of the new agricultural calendar would guide farmers to know when to plant and harvest.

Secondly, an organized and mutually agreeing system of crop and livestock rotation would be beneficial to both crop producers and livestock farmers. This should be followed by an increase in access to improved crop and livestock varieties made possible by Ministry of Agriculture and Rural Development (MINADER) through its special programs, such as the Programme for Agricultural Competitiveness (ACEFA). Community based institutions such as farming groups should be supported, based on their ability to collectively dissipate individual farmer climate related effects.

In addition, agro-pastoralists who generally operate as individuals, should be encouraged to work in collective, community based institutions (such as Common Initiative Groups and Cooperatives) as a strategy to absorb climatic shocks. The capacities of farmers should be further enhanced to be better prepared to make use of indigenous, endogenous and

exogenous adaptation strategies that are necessarily to sustainably manage the negative effects of climate change, and benefit from any positive fallouts.

ACKNOWLEDGMENTS

Our thanks to the anonymous referees who contributed immensely to improving the quality of this paper.

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